

TABLE NO. 1

W/O 4570.01

## MATERIALS AND CORROSION ALLOWANCES FOR HEAT TRANSFER EQUIPMENT

Date 1/27/50

| EQUIPT. NO. & NAME                                                                                                                                                                                                                                                                                                                                                                                                              | E-1 Overhead Condenser |                     |          |               |          |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------------|----------|---------------|----------|---------------|
| PART                                                                                                                                                                                                                                                                                                                                                                                                                            | MATERIAL               | C.A.<br>(Ins)       | MATERIAL | C.A.<br>(Ins) | MATERIAL | C.A.<br>(Ins) |
| Shell & Shell Cover                                                                                                                                                                                                                                                                                                                                                                                                             | Carbon steel           | 1/8                 |          |               |          |               |
| Channel                                                                                                                                                                                                                                                                                                                                                                                                                         | C.I. or Carbon steel   | 1/8 <sup>(3)</sup>  |          |               |          |               |
| Channel Cover                                                                                                                                                                                                                                                                                                                                                                                                                   | ditto                  | 1/8 <sup>(3)</sup>  |          |               |          |               |
| Floating Head                                                                                                                                                                                                                                                                                                                                                                                                                   | Carbon steel or C.I.   | 3/16 <sup>(3)</sup> |          |               |          |               |
| Tube Sheets                                                                                                                                                                                                                                                                                                                                                                                                                     | Naval rolled brass     | 1/16 <sup>(1)</sup> |          | (1)           |          | (1)           |
| Shell Side Baffles                                                                                                                                                                                                                                                                                                                                                                                                              | Carbon steel           | 1/8 <sup>(1)</sup>  |          | (1)           |          | (1)           |
| Tubes                                                                                                                                                                                                                                                                                                                                                                                                                           | 16 BWG Admiralty       | ----                |          |               |          |               |
| Internal Bolting                                                                                                                                                                                                                                                                                                                                                                                                                | Mfrs. Std.             |                     |          |               |          |               |
| Gaskets                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |                     |          |               |          |               |
| Channel Cover                                                                                                                                                                                                                                                                                                                                                                                                                   |                        |                     |          |               |          |               |
| Chan. - Fixed T.S.                                                                                                                                                                                                                                                                                                                                                                                                              | Compressed asbestos    |                     |          |               |          |               |
| Shell Cover                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |                     |          |               |          |               |
| Shell - Fixed T.S.                                                                                                                                                                                                                                                                                                                                                                                                              | ditto <sup>(2)</sup>   |                     |          |               |          |               |
| Floating Head                                                                                                                                                                                                                                                                                                                                                                                                                   | ditto <sup>(2)</sup>   |                     |          |               |          |               |
| Tube Layout                                                                                                                                                                                                                                                                                                                                                                                                                     |                        |                     |          |               |          |               |
| <p>(1) If tube sheets and/or baffles are fabricated as per<br/>TEMA Standards, no corrosion allowance is required.</p> <p>(2) Use steel jacketed asbestos filled or solid soft iron<br/>gaskets with tongue and groove flanges (steel jacketed<br/>asbestos is preferred over soft iron gaskets at Richmond).</p> <p>(3) No corrosion allowance is required<br/>for cast iron.</p> <p style="text-align: right;">TEMP 451-2</p> |                        |                     |          |               |          |               |

TABLE NO. 1  
MATERIALS AND CORROSION ALLOWANCES FOR HEAT TRANSFER EQUIPMENT

W/O 4520.16  
Date 1/21/50

| EQUIPT. NO. & NAME  | E-1 Feed-Overhead Exchanger                   |                     | E-3 Overhead Cooler  |                     | E-4 Steam Generator                           |                     |
|---------------------|-----------------------------------------------|---------------------|----------------------|---------------------|-----------------------------------------------|---------------------|
|                     | MATERIAL                                      | C.A.<br>(Ins)       | MATERIAL             | C.A.<br>(Ins)       | MATERIAL                                      | C.A.<br>(Ins)       |
| Shell & Shell Cover | Carbon steel                                  | 1/8                 | Carbon steel         | 1/8                 | Carbon steel                                  | 1/8                 |
| Channel             | ditto                                         | 1/16                | ditto                | 1/8                 | ditto                                         | 3/16                |
| Channel Cover       | ditto                                         | 1/16                | ditto                | 1/8                 | ditto                                         | 3/16                |
| Floating Head       | ditto                                         | 3/16                | C.I. or carbon steel | 3/16                | ditto                                         | 3/16                |
| Tube Sheets         | ditto                                         | 3/16 <sup>(1)</sup> | Naval rolled brass   | 1/16 <sup>(1)</sup> | ditto                                         | 3/16 <sup>(1)</sup> |
| Shell Side Baffles  | ditto                                         | 3/16 <sup>(1)</sup> | Carbon steel         | 1/8 <sup>(1)</sup>  | ditto                                         | 3/16 <sup>(1)</sup> |
| Tubes               | 14 BWG Carbon steel                           | ---                 | 16 BWG Admiralty     | ---                 | 11 BWG Carbon steel                           | ---                 |
| Internal Bolting    | Mfrs. Std.                                    | ---                 | Mfrs. Std.           | ---                 | Mfrs. Std.                                    | ---                 |
| Gaskets             |                                               |                     |                      |                     |                                               |                     |
| Channel Cover       | Steel double jacketed as-                     | (2)                 |                      |                     | Steel double jacketed                         | (2)                 |
| Chan. - Fixed T.S.  | bestos filled or soft iron                    | ---                 | Compressed asbestos  | ---                 | asbestos filled or soft iron.                 |                     |
| Shell Cover         |                                               |                     |                      |                     |                                               |                     |
| Shell - Fixed T.S.  | ditto                                         | ---                 | See Note (3)         | ---                 | ditto                                         | ---                 |
| Floating Head       | ditto                                         | ---                 | ditto                | ---                 | ditto                                         | ---                 |
| Tube Layout         | 90° rectangular with 1/4" min. cleaning lanes | ---                 | 60° Triangular       | ---                 | 90° rectangular with 1/4" min. cleaning lanes | ---                 |

- (1) If tube sheets and/or baffles are fabricated as per TEMA Standards, no corrosion allowance is required.  
(2) Steel double jacketed asbestos filled gaskets are preferred over soft iron gaskets at Richmond.

- (3) Compressed asbestos or steel double jacketed asbestos filled or soft iron. Steel double jacketed asbestos filled gaskets are preferred over soft iron gaskets at Richmond.

TEMP 451-2

TABLE NO. 1 (Cont'd)  
MATERIALS AND CORROSION ALLOWANCES FOR HEAT TRANSFER EQUIPMENT

W/O 4520.16  
Date 1/27/50

| EQUIPT. NO. & NAME                                                                                                                                                                                                                    |                            | E-5 Water Preheater |          |               |          |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------|----------|---------------|----------|---------------|
| PART                                                                                                                                                                                                                                  | MATERIAL                   | C.A.<br>(Ins)       | MATERIAL | C.A.<br>(Ins) | MATERIAL | C.A.<br>(Ins) |
| Shell & Shell Cover                                                                                                                                                                                                                   | Carbon steel               | 1/8                 |          |               |          |               |
| Channel                                                                                                                                                                                                                               | ditto                      | 1/8                 |          |               |          |               |
| Channel Cover                                                                                                                                                                                                                         | ditto                      | 1/8                 |          |               |          |               |
| Floating Head                                                                                                                                                                                                                         | ditto                      | 3/16                |          |               |          |               |
| Tube Sheets                                                                                                                                                                                                                           | ditto                      | 3/16 <sup>(1)</sup> |          | (1)           |          | (1)           |
| Shell Side Baffles                                                                                                                                                                                                                    | ditto                      | 3/16 <sup>(1)</sup> |          | (1)           |          | (1)           |
| Tubes                                                                                                                                                                                                                                 | 11 BWG Carbon steel        | ----                |          |               |          |               |
| Internal Bolting                                                                                                                                                                                                                      | Mfrs. Std.                 | ----                |          |               |          |               |
| Gaskets                                                                                                                                                                                                                               |                            |                     |          |               |          |               |
| Channel Cover                                                                                                                                                                                                                         | Steel double jacketed as-  | (2)                 |          |               |          |               |
| Chan.- Fixed T.S.                                                                                                                                                                                                                     | bestos filled or soft iron | ----                |          |               |          |               |
| Shell Cover                                                                                                                                                                                                                           |                            |                     |          |               |          |               |
| Shell - Fixed T.S.                                                                                                                                                                                                                    | ditto                      | ----                |          |               |          |               |
| Floating Head                                                                                                                                                                                                                         | ditto                      | ----                |          |               |          |               |
| Tube Layout                                                                                                                                                                                                                           | 60° Triangular             |                     |          |               |          |               |
| <p>(1) If tube sheets and/or baffles are fabricated as per<br/>TEMA Standards, no corrosion allowance is required.</p> <p>(2) Steel double jacketed asbestos filled gaskets are<br/>preferred over soft iron gaskets at Richmond.</p> |                            |                     |          |               |          |               |

TEMP 451-2

4518-RV2

TABLE NO. 2  
CENTRIFUGAL PUMP MATERIALS

w/o 4520.16  
Date 1/27/50

| EQUIPT. NO. & NAME                                               | G-1 Feed Pump                | G-2 Reflux Pump              | G-3 Quench Pump        |  |  |
|------------------------------------------------------------------|------------------------------|------------------------------|------------------------|--|--|
| PART                                                             | MATERIAL                     | MATERIAL                     | MATERIAL               |  |  |
| Case                                                             | Carbon steel or<br>Cast iron | Carbon steel or<br>Cast iron | Cast iron              |  |  |
| Impeller Wear Rings                                              | 12% Cr. Steel                | 12% Cr. Steel                | 12% Cr. Steel          |  |  |
| Case Wear Rings                                                  | 12% Cr. Steel                | 12% Cr. Steel                | 12% Cr. Steel          |  |  |
| Shaft                                                            | Mfrs. Std.                   | Mfrs. Std.                   | Mfrs. Std.             |  |  |
| Shaft Sleeves                                                    | See Note (1)                 | See Note (1)                 | See Note (1)           |  |  |
| Impeller                                                         | Cast iron                    | Cast iron                    | Cast iron              |  |  |
| Packing                                                          | Mfrs. Std.                   | Mfrs. Std.                   | Mfrs. Std.             |  |  |
| Lantern Ring                                                     | Mfrs. Std.                   | Mfrs. Std.                   | Mfrs. Std.             |  |  |
| Throat Bushing                                                   | Cast iron                    | Cast iron                    | Cast iron              |  |  |
| Casing Gasket                                                    | Compressed<br>asbestos       | Compressed<br>asbestos       | Compressed<br>asbestos |  |  |
| (1) Case hardened steel, or Colmonoy or<br>Stellite faced steel. |                              |                              |                        |  |  |
| TEMP 451-1                                                       |                              |                              |                        |  |  |

TABLE NO. 3  
RECIPROCATING PUMP MATERIALS (LIQUID END)

W/O 4520.16  
 Date 1/27/50

| EQUIPT. NO. & NAME | G-2 & G-2A<br>Reflux Pumps               |  |  |  |  |
|--------------------|------------------------------------------|--|--|--|--|
| PART               | MATERIAL                                 |  |  |  |  |
| Body               | Cast iron                                |  |  |  |  |
| Cylinder Liner     | Mi-Resist                                |  |  |  |  |
| Piston             | Cast iron                                |  |  |  |  |
| Piston Rod         | Heat treated type<br>414 or 410 Cr.Steel |  |  |  |  |
| Piston Packing     | Mfrs. Std.                               |  |  |  |  |
| Piston Rod Packing | Mfrs. Std.                               |  |  |  |  |
| Valves             | 11-13% Cr. steel<br>or Tuffite           |  |  |  |  |
| Valve Seats        | Cast iron                                |  |  |  |  |
| Valve Stems        | 11-13% Cr. steel                         |  |  |  |  |
| Valve Springs      | 11-13% Cr. steel                         |  |  |  |  |
| Gaskets            | Compressed<br>asbestos                   |  |  |  |  |
| TEMP 451-3         |                                          |  |  |  |  |

518-N/2

TABLE NO. 1  
MATERIALS AND CORROSION ALLOWANCES FOR HEAT TRANSFER EQUIPMENT

w/o 4520.16  
Date 4/5/50

| EQUIP. NO. & NAME                                                                                              | E-1 Feed-Overhead Exchanger                                 |                        | E-3 Overhead Cooler                                                                                                                                                                    |                        | E-4 Steam Generator                                         |                        |
|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------------------------------------------|------------------------|
| PART                                                                                                           | MATERIAL                                                    | C.A.<br>(Ins.)         | MATERIAL                                                                                                                                                                               | C.A.<br>(Ins.)         | MATERIAL                                                    | C.A.<br>(Ins.)         |
| Shell & Shell Cover                                                                                            | Carbon steel                                                | 1/8                    | Carbon steel                                                                                                                                                                           | 1/8                    | Carbon steel                                                | 1/8                    |
| Channel                                                                                                        | ditto                                                       | 1/16                   | ditto                                                                                                                                                                                  | 1/8                    | ditto                                                       | 3/16                   |
| Channel Cover                                                                                                  | ditto                                                       | 1/16                   | ditto                                                                                                                                                                                  | 1/8                    | ditto                                                       | 3/16                   |
| Floating Head                                                                                                  | ditto                                                       | 3/16                   | C.I. or carbon steel                                                                                                                                                                   | 3/16                   | ditto                                                       | 3/16                   |
| Tube Sheets                                                                                                    | ditto                                                       | <sup>(1)</sup><br>3/16 | Naval rolled brass                                                                                                                                                                     | <sup>(1)</sup><br>1/16 | ditto                                                       | <sup>(1)</sup><br>3/16 |
| Shell Side Baffles                                                                                             | ditto                                                       | <sup>(1)</sup><br>3/16 | Carbon steel                                                                                                                                                                           | <sup>(1)</sup><br>1/8  | ditto                                                       | <sup>(1)</sup><br>3/16 |
| Tubes                                                                                                          | 14 BWG Carbon steel                                         | ---                    | 16 BWG Admiralty                                                                                                                                                                       | ---                    | 11 BWG Carbon steel                                         | ---                    |
| Internal Bolting                                                                                               | Mfrs. Std.                                                  | ---                    | Mfrs. Std.                                                                                                                                                                             | ---                    | Mfrs. Std.                                                  | ---                    |
| Gaskets                                                                                                        |                                                             |                        |                                                                                                                                                                                        |                        |                                                             |                        |
| Channel Cover                                                                                                  |                                                             |                        |                                                                                                                                                                                        |                        |                                                             |                        |
| Chan. - Fixed T.S.                                                                                             | See Note (2)                                                | ---                    | Compressed asbestos                                                                                                                                                                    | ---                    | See Note (2)                                                |                        |
| Shell Cover                                                                                                    |                                                             |                        |                                                                                                                                                                                        |                        |                                                             |                        |
| Shell - Fixed T.S.                                                                                             | ditto                                                       | ---                    | See Note (2)                                                                                                                                                                           | ---                    | ditto                                                       | ---                    |
| Floating Head                                                                                                  | ditto                                                       | ---                    | ditto                                                                                                                                                                                  | ---                    | ditto                                                       | ---                    |
| Tube Layout                                                                                                    | 90° rectangular with $\frac{1}{4}$ "<br>min. cleaning lanes | ---                    | 60° Triangular                                                                                                                                                                         | ---                    | 90° rectangular with<br>$\frac{1}{4}$ " min. cleaning lanes | ---                    |
| (1) If tube sheets and/or baffles are fabricated as per<br>TEMA Standards, no corrosion allowance is required. |                                                             |                        | (2) Compressed asbestos or steel double jacketed<br>asbestos filled or soft iron. Steel double<br>jacketed asbestos filled gaskets are preferred<br>over soft iron gaskets at Richmond |                        |                                                             |                        |
| TEMP. 451-2                                                                                                    |                                                             |                        |                                                                                                                                                                                        |                        |                                                             |                        |

518-RV2

TABLE NO. 1 (Cont'd.)  
MATERIALS AND CORROSION ALLOWANCES FOR HEAT TRANSFER EQUIPMENT

W/O 4520.16  
Date 4/5/50

| EQUIP. NO. & NAME                                                                                                                                                                                                           | E-5 Water Preheater        |               |          |               |          |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------|----------|---------------|----------|---------------|
| PART                                                                                                                                                                                                                        | MATERIAL                   | C.A.<br>(Ins) | MATERIAL | C.A.<br>(Ins) | MATERIAL | C.A.<br>(Ins) |
| Shell & Shell Cover                                                                                                                                                                                                         | Carbon steel               | 1/8           |          |               |          |               |
| Channel                                                                                                                                                                                                                     | ditto                      | 1/8           |          |               |          |               |
| Channel Cover                                                                                                                                                                                                               | ditto                      | 1/8           |          |               |          |               |
| Floating Head                                                                                                                                                                                                               | ditto                      | 3/16          |          |               |          |               |
| Tube Sheets                                                                                                                                                                                                                 | ditto                      | 3/16          |          | (1)           |          | (1)           |
| Shell Side Baffles                                                                                                                                                                                                          | ditto                      | 3/16          |          | (1)           |          | (1)           |
| Tubes                                                                                                                                                                                                                       | 11 BWG Carbon steel        | ---           |          |               |          |               |
| Internal Bolting                                                                                                                                                                                                            | Mtrs. Std.                 | ---           |          |               |          |               |
| Gaskets                                                                                                                                                                                                                     |                            |               |          |               |          |               |
| Channel Cover                                                                                                                                                                                                               | Steel double jacketed as-  | (2)           |          |               |          |               |
| Chan- Fixed T.S.                                                                                                                                                                                                            | bestos filled or soft iron | ---           |          |               |          |               |
| Shell Cover                                                                                                                                                                                                                 |                            |               |          |               |          |               |
| Shell - Fixed T.S.                                                                                                                                                                                                          | ditto                      | ---           |          |               |          |               |
| Floating Head                                                                                                                                                                                                               | ditto                      | ---           |          |               |          |               |
| Tube Layout                                                                                                                                                                                                                 | 60° Triangular             |               |          |               |          |               |
| <p>(1) If tube sheets and/or baffles are fabricated as per TEMA Standards, no corrosion allowance is required.<br/> (2) Steel double jacketed asbestos filled gaskets are preferred over soft iron gaskets at Richmond.</p> |                            |               |          |               |          |               |

TEMP. 451-2

518-RV2

CHEV

TABLE NO. 2  
CENTRIFUGAL PUMP MATERIALS

W/O 4520.16  
Date 4/5/50

| EQUIP. NO. & NAME                                             | P-1 Feed Pump       | P3 & P3A Quench Pumps |  |  |
|---------------------------------------------------------------|---------------------|-----------------------|--|--|
| PART                                                          | MATERIAL            | MATERIAL              |  |  |
| Case                                                          | Carbon steel        | Carbon steel          |  |  |
| Impeller Wear Rings                                           | 12% Cr. steel       | 12% Cr. steel         |  |  |
| Case Wear Rings                                               | 12% Cr. steel       | 12% Cr. steel         |  |  |
| Shaft                                                         | Mfrs. Std.          | Mfrs. Std.            |  |  |
| Shaft Sleeves                                                 | See Note (1)        | See Note (1)          |  |  |
| Impeller                                                      | Cast iron           | Cast iron             |  |  |
| Packing                                                       | Mfrs. Std.          | Mfrs. Std.            |  |  |
| Lantern Ring                                                  | Mfrs. Std.          | Mfrs. Std.            |  |  |
| Throat Bushing                                                | Cast iron           | Cast iron             |  |  |
| Casing Gasket                                                 | Compressed asbestos | Compressed asbestos   |  |  |
| (1) Case hardened steel, or Colmonoy or Stellite faced steel. |                     |                       |  |  |
| TEMP. 451-1                                                   |                     |                       |  |  |

518-RV2

TABLE NO. 3  
RECIPROCATING PUMP MATERIALS (LIQUID END)

W/O 4520.16  
Date 4/5/50

| EQUIP. NO. & NAME  | P-2 & P-2A<br>Reflux Pumps                |  |
|--------------------|-------------------------------------------|--|
| PART               | MATERIAL                                  |  |
| Body               | Carbon steel                              |  |
| Cylinder Liner     | M1-Resist                                 |  |
| Piston             | Cast iron                                 |  |
| Piston Rod         | Heat treated type<br>#140 or 410 Cr.Steel |  |
| Piston Packing     | Mfrs. Std.                                |  |
| Piston Rod Packing | Mfrs. Std.                                |  |
| Valves             | 11-13% Cr. steel<br>or Tuffite            |  |
| Valve Seats        | Cast iron                                 |  |
| Valve Stems        | 11-13% Cr. steel                          |  |
| Valve Springs      | 11-13% Cr. steel                          |  |
| Gaskets            | Compressed<br>asbestos                    |  |
| TEMP. 451-3        |                                           |  |

518 RV2

TABLE NO. 1  
MATERIALS AND CORROSION ALLOWANCES FOR HEAT TRANSFER EQUIPMENT

W/O 4094.02  
Date 4/6/50

| EQUIP. NO. & NAME   | E-1 Absorber<br>Intercooler      |               | E-2 Absorber<br>Intercooler      |               | E-3 Absorber<br>Lean Oil Cooler  |               |
|---------------------|----------------------------------|---------------|----------------------------------|---------------|----------------------------------|---------------|
|                     | MATERIAL                         | C.A.<br>(Ins) | MATERIAL                         | C.A.<br>(Ins) | MATERIAL                         | C.A.<br>(Ins) |
| Shell & Shell Cover | Carbon steel                     | 1/8           | Carbon steel                     | 1/8           | Carbon steel                     | 1/8           |
| Channel             | Carbon steel                     | 1/8           | Carbon steel                     | 1/8           | Carbon steel                     | 1/8           |
| Channel Cover       | Carbon steel                     | 1/8           | Carbon steel                     | 1/8           | Carbon steel                     | 1/8           |
| Floating Head       | Carbon steel or<br>Cast iron     | 3/16<br>----  | Carbon steel or<br>Cast iron     | 3/16<br>----  | Carbon steel or<br>Cast iron     | 3/16<br>----  |
| Tube Sheets         | Naval rolled brass               | 1/16<br>(1)   | Naval rolled brass               | 1/16<br>(1)   | Naval rolled brass               | 1/16<br>(1)   |
| Shell Side Baffles  | Carbon steel                     | 1/8           | Carbon steel                     | 1/8           | Carbon steel                     | 1/8           |
| Tubes               | 3/4" - 16 ga.<br>Admiralty metal |               | 3/4" - 16 ga.<br>Admiralty metal |               | 3/4" - 16 ga.<br>Admiralty metal |               |
| Internal Bolting    | Mfrs. Std.                       |               | Mfrs. Std.                       |               | Mfrs. Std.                       |               |
| askets              |                                  |               |                                  |               |                                  |               |
| Channel Cover       | Compressed<br>asbestos           |               | Compressed<br>asbestos           |               | Compressed<br>asbestos           |               |
| Chan. - Fixed T.S.  | Compressed<br>asbestos           |               | Compressed<br>asbestos           |               | Compressed<br>asbestos           |               |
| Shell Cover         | Compressed<br>asbestos           |               | Compressed<br>asbestos           |               | Compressed<br>asbestos           |               |
| Shell - Fixed T.S.  | Compressed<br>asbestos           |               | Compressed<br>asbestos           |               | Compressed<br>asbestos           |               |
| Floating Head       | Compressed<br>asbestos           |               | Compressed<br>asbestos           |               | Compressed<br>asbestos           |               |
| Tube Layout         | 60° Triangular                   |               | 60° Triangular                   |               | 60° Triangular                   |               |

(1) If tube sheets and/or baffles are fabricated as per  
TEMA Standards, no corrosion allowance is required

TEMP. 451-2

518 RV2

TABLE NO. 1 (Cont'd)  
MATERIALS AND CORROSION ALLOWANCES FOR HEAT TRANSFER EQUIPMENT

W/O 4094.02  
Date 4/6/50

| EQUIP. NO. & NAME                                                                                                                                                                                                                                   | E-6 Absorber<br>Lower Reboiler                           |               | E-7 Debutanizer<br>O.H. Condenser |               | E-9 and E-10<br>Gasoline Coolers |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------|-----------------------------------|---------------|----------------------------------|---------------|
| PART                                                                                                                                                                                                                                                | MATERIAL                                                 | C.A.<br>(Ins) | MATERIAL                          | C.A.<br>(Ins) | MATERIAL                         | C.A.<br>(Ins) |
| Shell & Shell Cover                                                                                                                                                                                                                                 | Carbon steel                                             | 1/8           | Carbon steel                      | 1/8           | Carbon steel                     | 1/8           |
| Channel                                                                                                                                                                                                                                             | Carbon steel                                             | 1/16          | Carbon steel                      | 1/8           | Carbon steel                     | 1/8           |
| Channel Cover                                                                                                                                                                                                                                       | Carbon steel                                             | 1/16          | Carbon steel                      | 1/8           | Carbon steel                     | 1/8           |
| Floating Head                                                                                                                                                                                                                                       | Carbon steel or<br>Cast iron                             | 3/16<br>----  | Carbon steel or<br>Cast iron      | 3/16<br>----  | Carbon steel or<br>Cast iron     | 3/16<br>----  |
| Tube Sheets                                                                                                                                                                                                                                         | Carbon steel                                             | (1)<br>3/16   | Naval rolled brass                | (1)<br>1/16   | Naval rolled brass               | (1)<br>1/16   |
| Shell Side Baffles                                                                                                                                                                                                                                  | Carbon steel                                             | (1)<br>1/8    | Carbon steel                      | (1)<br>1/8    | Carbon steel                     | (1)<br>1/8    |
| Tubes                                                                                                                                                                                                                                               | 1" - 11 ga.<br>Carbon steel                              |               | 3/4" - 16 ga.<br>Admiralty metal  |               | 3/4" - 16 ga.<br>Admiralty metal |               |
| Internal Bolting                                                                                                                                                                                                                                    | Mfrs. Std.                                               |               | Mfrs. Std.                        |               | Mfrs. Std.                       |               |
| Gaskets                                                                                                                                                                                                                                             |                                                          |               |                                   |               |                                  |               |
| Channel Cover                                                                                                                                                                                                                                       | Compressed (2)<br>asbestos                               |               | Compressed<br>asbestos            |               | Compressed<br>asbestos           |               |
| Chan. - Fixed T.S.                                                                                                                                                                                                                                  | Compressed (2)<br>asbestos                               |               | Compressed<br>asbestos            |               | Compressed<br>asbestos           |               |
| Shell Cover                                                                                                                                                                                                                                         | Compressed (2)<br>asbestos                               |               | Compressed<br>asbestos            |               | Compressed<br>asbestos           |               |
| Shell - Fixed T.S.                                                                                                                                                                                                                                  | Compressed (2)<br>asbestos                               |               | Compressed<br>asbestos            |               | Compressed<br>asbestos           |               |
| Floating Head                                                                                                                                                                                                                                       | Compressed (2)<br>asbestos                               |               | Compressed<br>asbestos            |               | Compressed<br>asbestos           |               |
| Tube Layout                                                                                                                                                                                                                                         | Rectangular pitch<br>with $\frac{1}{4}$ " cleaning lanes |               | 60° Triangular                    |               | 60° Triangular                   |               |
| <p>(1) If tube sheets and/or baffles are fabricated as per<br/>TEMA Standards, no corrosion allowance is required.</p> <p>(2) Carbon steel double jacketed asbestos filled or soft<br/>iron ring gaskets if tongue and groove flanges are used.</p> |                                                          |               |                                   |               |                                  |               |

TEMP. 451-2

518-R/22

TABLE NO. 2  
CENTRIFUGAL PUMP MATERIALS

W/O 4094.02  
Date 4/6/50

| EQUIP. NO. & NAME   | P-1 & P-2 Absorb-<br>er Intercoolers   | P-3 Debutanizer<br>Reflux              | P-4 Berun<br>Reflux                    | P-5 Berun<br>Bottoms         | P-6 Debutanizer<br>Fired Heater Chg. |
|---------------------|----------------------------------------|----------------------------------------|----------------------------------------|------------------------------|--------------------------------------|
| PART                |                                        |                                        |                                        |                              |                                      |
| Case                | Carbon steel                           | Carbon steel                           | Carbon steel                           | Carbon steel                 | Carbon steel                         |
| Impeller Wear Rings | 12 Cr. steel                           | 12 Cr. steel                           | 12 Cr. steel                           | 12 Cr. steel                 | 12 Cr. steel                         |
| Case Wear Rings     | 12 Cr. steel                           | 12 Cr. steel                           | 12 Cr. steel                           | 12 Cr. steel                 | 12 Cr. steel                         |
| Shaft               | Mfrs. Std. (1)                         | Mfrs. Std. (1)                         | Mfrs. Std. (1)                         | 12 Cr. steel                 | 12 Cr. steel                         |
| Shaft Sleeves       | Case hard or Col-<br>monoy faced steel | Case hard or Col-<br>monoy faced steel | Case hard or Col-<br>monoy faced steel | Colmonoy faced<br>steel      | Colmonoy faced<br>steel              |
| Impeller            | Cast iron                              | Cast iron                              | Cast iron                              | 12 Cr. steel                 | 12 Cr. steel                         |
| Packing             | ---                                    | ---                                    | ---                                    | ---                          | ---                                  |
| Lantern Ring        | Carbon steel<br>or Cast iron           | Carbon steel<br>or Cast iron           | Carbon steel<br>or Cast iron           | Carbon steel<br>or Cast iron | Carbon steel<br>or Cast iron         |
| Throat Bushing      | Carbon steel<br>or Cast iron           | Carbon steel<br>or Cast iron           | Carbon steel<br>or Cast iron           | 12 Cr. steel                 | 12 Cr. steel                         |
| Casing Gasket       | Compressed<br>asbestos                 | Compressed<br>asbestos                 | Compressed<br>asbestos                 | Compressed<br>asbestos       | Compressed<br>asbestos               |

(1) Non-ferrous materials should not be used because of fire hazard.

TEMP. 451-1

518 RV-2

TABLE NO. 2 (Cont'd.)  
CENTRIFUGAL PUMP MATERIALS

W/O 4094.02  
Date 4/6/50

| EQUIP. NO. & NAME                                                    | P-7 Rerun Fired Heater Charge | P-8 Heavy Gasoline to Storage     |  |  |  |
|----------------------------------------------------------------------|-------------------------------|-----------------------------------|--|--|--|
| PART                                                                 |                               |                                   |  |  |  |
| Case                                                                 | Carbon steel                  | Carbon steel                      |  |  |  |
| Impeller Wear Rings                                                  | 12 Cr. steel                  | 12 Cr. steel                      |  |  |  |
| Case Wear Rings                                                      | 12 Cr. steel                  | 12 Cr. steel                      |  |  |  |
| Shaft                                                                | 12 Cr. steel                  | Mfrs. Std. (1)                    |  |  |  |
| Shaft Sleeves                                                        | Colmonoy faced steel          | Case hard or Colmonoy faced steel |  |  |  |
| Impeller                                                             | 12 Cr. steel                  | Cast iron                         |  |  |  |
| Packing                                                              | ---                           | ---                               |  |  |  |
| Lantern Ring                                                         | Carbon steel or Cast iron     | Carbon steel or Cast iron         |  |  |  |
| Throat Bushing                                                       | 12 Cr. steel                  | Carbon steel or Cast iron         |  |  |  |
| Casing Gasket                                                        | Compressed asbestos           | Compressed asbestos               |  |  |  |
| (1) Non-ferrous materials should not be used because of fire hazard. |                               |                                   |  |  |  |
| TEMP. 451-1                                                          |                               |                                   |  |  |  |

518-RV2